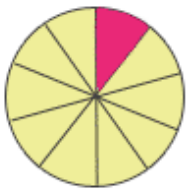
Different types of fraction

There are different types of fraction. Two types are **unit fractions** and **non-unit fractions**.

Unit fractions
Unit means one. Here are some examples of unit fractions:


$\frac{1}{3}$


one tenth


a fifth


a half


$\frac{1}{4}$

Can you spot the pattern? A unit fraction is one part of a whole that is divided into equal parts.

A unit fraction has 1 as the top number, which is the numerator.

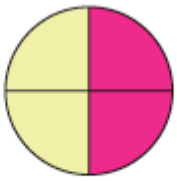
Have another look at the fractions above. With unit fractions, when the bottom number - called the **denominator** - is bigger, the value of the unit fraction is smaller.

What other unit fractions can you think of?

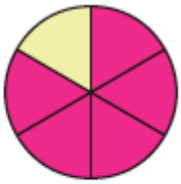
Non-unit fractions
Unit means one, so non-unit is any number apart from one. Here are some examples of non-unit fractions.


$\frac{2}{3}$


three fifths


two quarters


$\frac{5}{8}$


$\frac{5}{6}$

A non-unit fraction is many parts of a whole that is divided into equal parts.

A non-unit fraction has a numerator that isn't 1.

What other non-unit fractions can you think of?

Estimating fractions

When you're sharing or dividing items into fractions you can estimate - or guess - the amount. If you have four friends around for a pizza you probably don't spend time measuring each quarter exactly! Often when using fractions you estimate measurements, for example when you split food up into pieces:

half a bar of chocolate

a quarter of a pizza

a cake cut into quarters

You estimate halves and quarters in everyday life. Sometimes you use them to compare sizes, or to describe something. For example:

The child is about half, or $\frac{1}{2}$, the height of the man.

There's about a quarter, or $\frac{1}{4}$, off the price in the sales!

My train will be about a quarter of an hour late.

The glass is half full. Or are you the type of person who would say the glass is half empty?

When else have you used fractions in everyday life?

Recognising fractions from shapes

You need to be able to recognise and name fractions in shapes. This will help you recognise fractions in everyday shapes, such as when cutting a pizza into quarters!

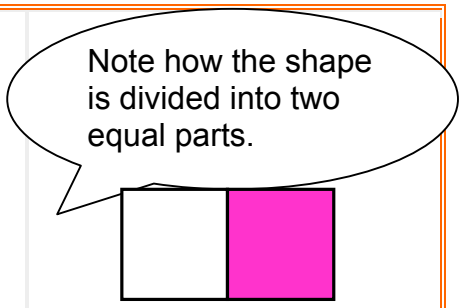
Let's look at how you 'read' fraction shapes.

First, look at how many parts there are:

This shape is split into two equal parts, the bottom number of the fraction.

Next, look at how many parts are shaded:

One part is shaded, this is the top number of the fraction.



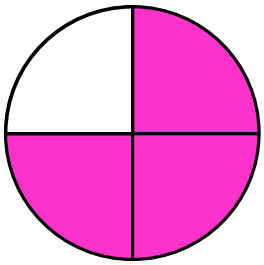
The shaded fraction is one out of the two parts. This is **a half**, or $\frac{1}{2}$.

Here are some more examples:

This shape is split into four equal parts, the bottom number of the fraction.

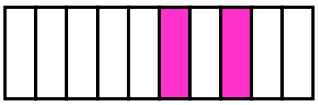
Three parts are shaded - this is the top number of the fraction.

The shaded fraction is three out of the four parts. This is **three quarters**, or $\frac{3}{4}$.



This shape is split into ten equal parts, the bottom number of the fraction.

Two parts are shaded, this is the top number of the fraction.



The shaded fraction is two out of the ten parts. This is **two tenths**, or $\frac{2}{10}$.

What do the numbers in fractions mean?

Let's have a look at our pie again:

$\frac{3}{4}$

The top number shows how many pieces we have of the whole pie. Here, we have 3 pieces, or parts. This is called the **numerator**.

The bottom number shows how many pieces there are in the whole pie. Here, the whole is split into 4 pieces, or parts. This is called the **denominator**.

Tip

To remember which is which,

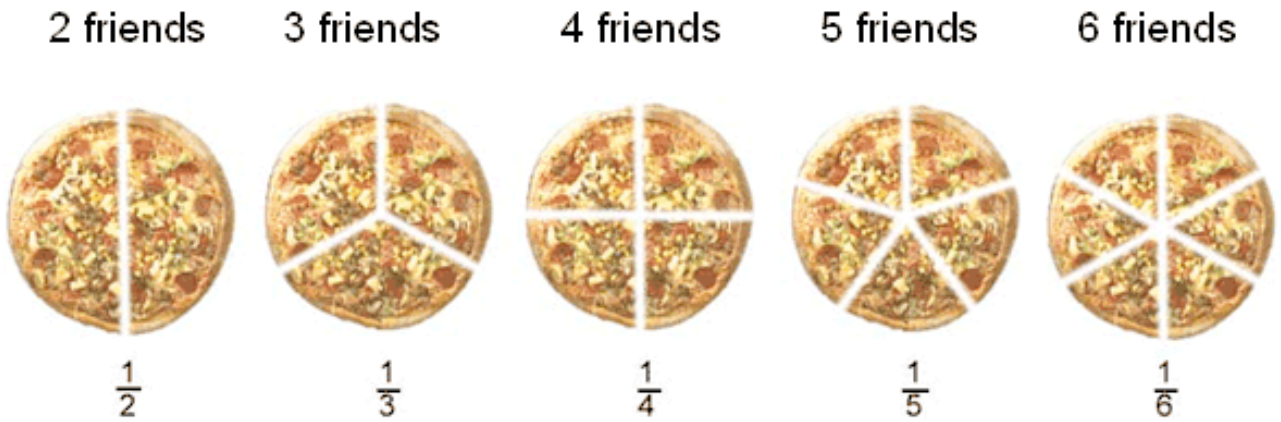
n**u**merator is **up**

and **d**enominator is **down**.

Fraction pieces

With fractions, the larger the denominator (the number on the bottom) the more pieces a whole is split up into and the smaller the pieces. For example, the more people you share a pizza with, the smaller your piece will be.

For example, the pizzas below have been split up to be shared between:



What is a fraction?

It's simple to count whole things like these pies.

There are four whole pies here.

But what if we take away one part of a pie - like this?

The pie has been cut into four **equal** parts. One part has been taken away. Each piece of pie is a part of the whole pie.

A fraction is part of something.

This is how we write fractions:

$\frac{3}{4}$ ← Three pieces of pie are left.

$\frac{3}{4}$ ← The pie is cut into 4 equal pieces.

We say this fraction is three quarters.

This is how much pie has been taken away:

$\frac{1}{4}$ ← One piece of pie was taken away.

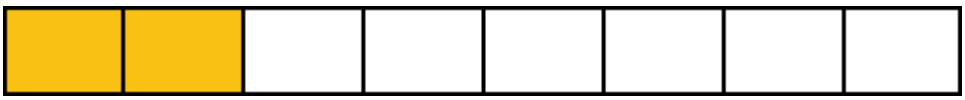
$\frac{1}{4}$ ← The pie is cut into 4 equal pieces.

We say this fraction is one quarter.

Comparing fractions

Here's a reminder of how to compare the size of fractions.

Example
This long box has been divided into eight equal parts. What fraction of the long box is shaded orange?



The long box has been divided into eight, so each small piece is one eighth, or $\frac{1}{8}$, of the whole long box.

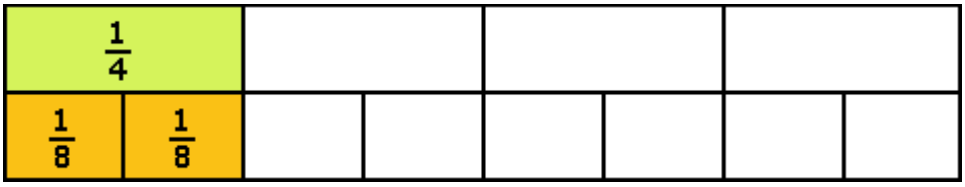
Two parts are shaded orange. So two of the eighths, or $\frac{1}{8}$s, are shaded. This means the fraction will have 2 on the top.

So the fraction of the long box that is shaded orange is $\frac{2}{8}$.

Example
This long box has been cut into four pieces and one piece has been shaded green.

The fraction of the long box shaded green is one quarter, or $\frac{1}{4}$.

We can compare the two fractions by putting them next to each other like this:



You can see that the amount shaded is the same in each strip. This means that the fractions are the same, or equal in value.

So $\frac{2}{8}$ is the same value as $\frac{1}{4}$.

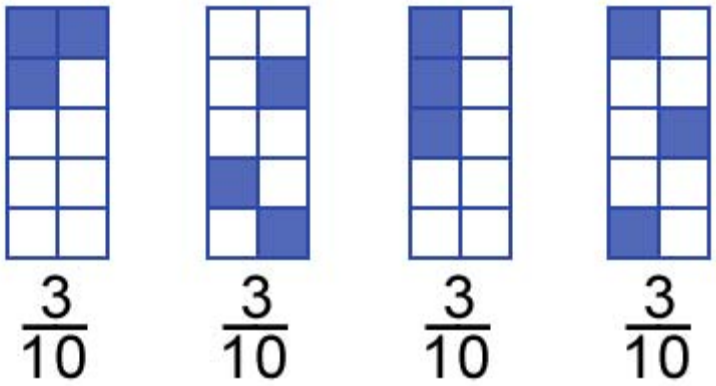
We can write this as $\frac{2}{8} = \frac{1}{4}$

Different ways to get the same fraction

We all know how to halve a flapjack so that we get our fair share!

When you divide things into fractions it doesn't matter how you do it as long as the parts are all equal in size.

Each rectangle below has been divided into ten parts. Each of the parts is $\frac{1}{10}$. The rectangles all have three out of their ten parts shaded - or three tenths - which is written $\frac{3}{10}$. All the rectangles have the same fraction shaded.



These shapes also have the same fraction shaded. They have ten parts and three of the parts have been shaded.

Equivalent fractions

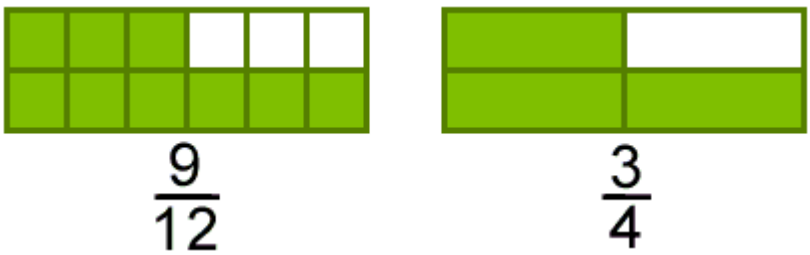
These cakes have been cut into slices. One has been cut into six equal parts, or sixths, and the other into two equal parts, or halves.

Can you see that three parts of the one on the left is same as half of the cake?

You can write this in fractions as $\frac{3}{6}$ equals $\frac{1}{2}$.

These fractions are known as **equivalent fractions** because they have the same value.

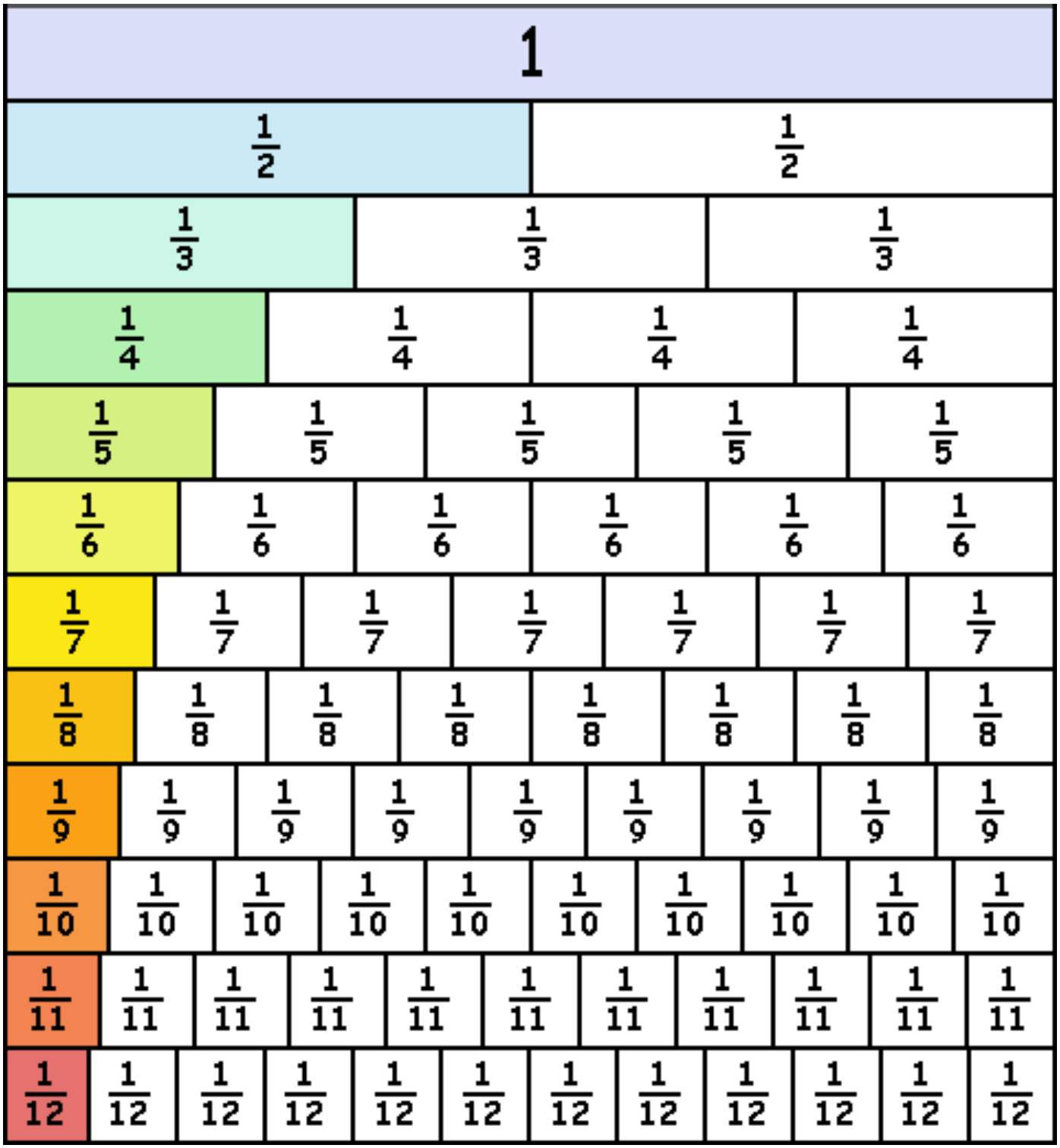
Here's another example of equivalent fractions. Here both diagrams show $\frac{3}{4}$.



So $\frac{9}{12}$ is equivalent to $\frac{3}{4}$.

Using a fraction wall

You can use a fraction wall like this to compare fractions with each other. You might find it helpful to print this out to use with the other factsheets and worksheets.



Recognising fractions in words

You might see fractions in shops, on bills, in newspapers and recipes. It's useful to recognise fractions when they're written as words.

Fraction	Word	Plural
$\frac{1}{2}$	One half (a half)	halves
$\frac{1}{3}$	One third	thirds
$\frac{1}{4}$	One quarter	quarters
$\frac{1}{5}$	One fifth	fifths
$\frac{1}{6}$	One sixth	sixths
$\frac{1}{7}$	One seventh	sevenths
$\frac{1}{8}$	One eighth	eighths
$\frac{1}{9}$	One ninth	ninths
$\frac{1}{10}$	One tenth	tenths

It's easy really to make the words, apart from the first four. All the other fractions are like the numbers but with a 'th' sound added at the end.

It's even easier to make the plurals, as long as you're careful with the plural of $\frac{1}{2}$. You just need to put an 's' on the end of the other fractions.

Fractions of a whole

What if you have a cake cut into six equal parts?

$\frac{1}{6}$

One slice is $\frac{1}{6}$ of the cake.

$\frac{5}{6}$

Five slices are $\frac{5}{6}$ of the cake.

But if it's too delicious to give away, then you would have $\frac{6}{6}$ of the cake!

$\frac{6}{6}$

If you put all six slices together they make the whole cake.

So $\frac{6}{6} = 1$.

Here are all the fractions you can make.

Fractions that can't be simplified

Take a look at these fractions: $\frac{3}{4}$, $\frac{4}{5}$, $\frac{7}{8}$, $\frac{9}{11}$.

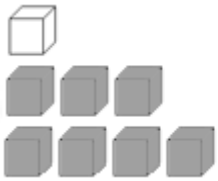
What do you notice about them? Can they be simplified?

There is **no** number that can go into both the **top number** and the **bottom number** exactly, so these fractions **can't** be simplified.

They're already in their simplest form.

$\frac{3}{4}$ of this shape is shaded.

$\frac{4}{5}$ of this shape is shaded.



$\frac{7}{8}$ of these shapes are shaded.

$\frac{9}{11}$ of these shapes are shaded.

Have a look at these fractions: $\frac{5}{6}$, $\frac{6}{7}$, $\frac{7}{9}$, $\frac{10}{11}$. Can you simplify any of them?

None of them can be simplified because in each fraction there is no number that will go into both the top number and the bottom number without leaving a remainder.

Let's look at $\frac{5}{6}$.

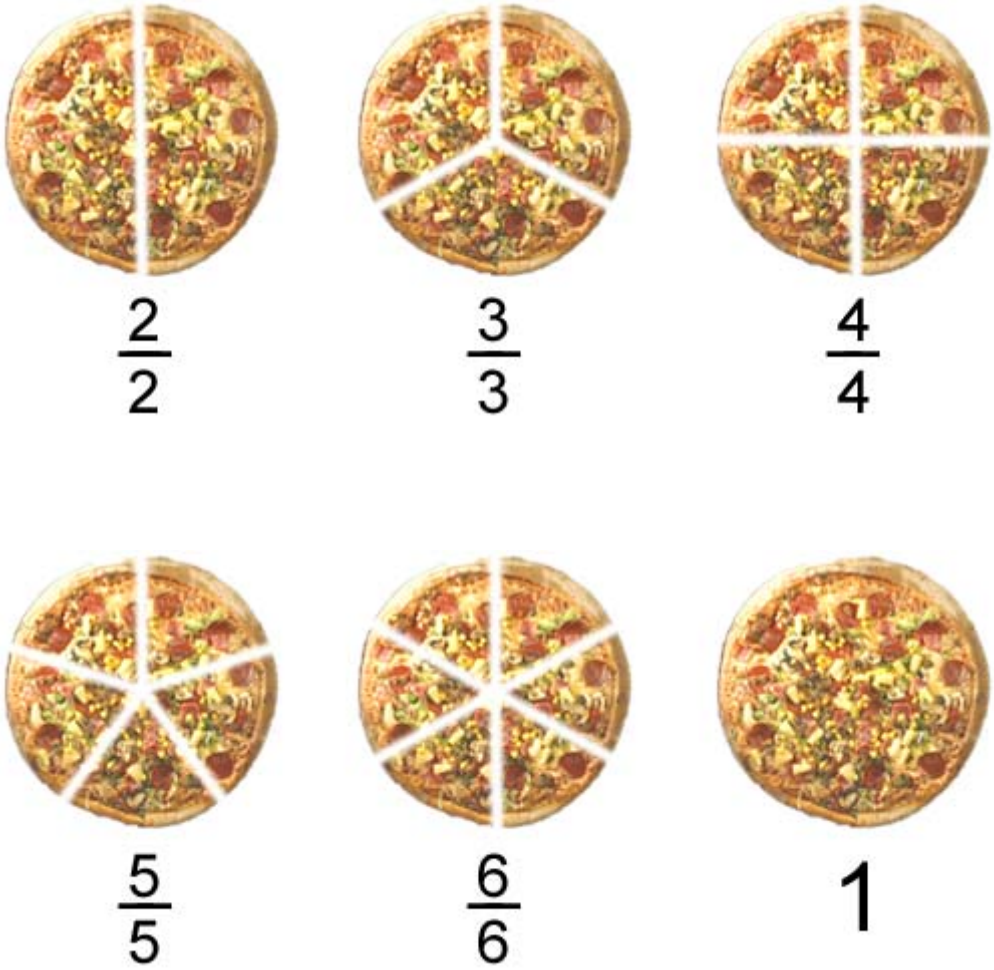
The numbers less than 5 (the top number) but greater than 1 are **2**, **3** and **4**.

2 goes into 6 exactly three times, but doesn't go exactly into 5, as 5 ÷ 2 has a remainder of 1.
3 goes into 6 exactly twice, but doesn't go exactly into 5, as 5 ÷ 3 has a remainder of 2.
5 ÷ **4** leaves a remainder and 6 ÷ **4** also leaves a remainder, so 4 leaves a remainder in both 5 and 6.

We can't use any of 2, 3 or 4 to simplify the fraction. So it's impossible to simplify $\frac{5}{6}$.

Fractions that equal one

All these pizzas have been sliced up in different ways, ready to be eaten. If you keep all the parts together they make a whole pizza or a fraction that's equivalent to a whole one.



So if the number on the top of a fraction is the same as the number on the bottom then you have exactly one.

$\frac{2}{2} = \frac{3}{3} = \frac{4}{4} = \frac{5}{5} = \frac{6}{6} = 1$

Simplifying fractions

Perhaps you think that fractions can never be simple, but they can often be written more simply. Have a look at these fractions and decide which one is the simplest. $\frac{1}{2}$, $\frac{4}{8}$, $\frac{5}{10}$, $\frac{6}{12}$, $\frac{9}{18}$.

You probably chose $\frac{1}{2}$, which represents a half. But all the other fractions in the list can be simplified and they're the same as $\frac{1}{2}$. They're known as equivalent fractions.

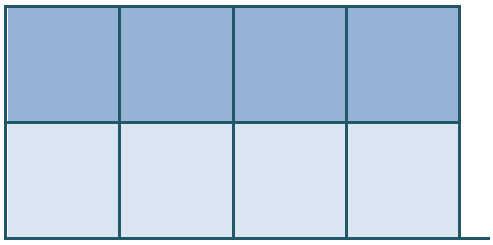
The important thing is that you must find a number that divides into **both** the top and bottom numbers at the same time. This is sometimes called **cancelling down**.

This is the case with the fractions above. For these fractions, you can divide the top and bottom of each one by the **numerator** - the number on the top.

Take $\frac{4}{8}$. We can divide both numbers by 4.

For the top number: $4 \div 4 = \mathbf{1}$
For the bottom number: $8 \div 4 = \mathbf{2}$
So $\frac{4}{8}$ is the same as $\frac{1}{2}$.

$$\frac{4}{8} \xrightarrow{\div 4} \frac{1}{2}$$



You can see this process in the above diagram - the four squares in darker blue are one half of the whole.

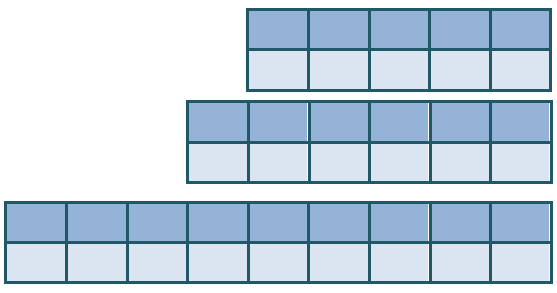
Now try simplifying the other fractions in the same way: $\frac{5}{10}$, $\frac{6}{12}$, $\frac{9}{18}$.

Tip
The numerators - top numbers - 5, 6 and 9 are the biggest numbers that will go into both the numerator and the denominator - bottom number - exactly.

$5 \div 5 = \mathbf{1}$ and $10 \div 5 = \mathbf{2}$, so $\frac{5}{10}$ is the same as $\frac{1}{2}$.

$6 \div 6 = \mathbf{1}$ and $12 \div 6 = \mathbf{2}$, so $\frac{6}{12}$ is the same as $\frac{1}{2}$.

$9 \div 9 = \mathbf{1}$ and $18 \div 9 = \mathbf{2}$, so $\frac{9}{18}$ is the same as $\frac{1}{2}$.



So you can simplify **all** the fractions on this page to $\frac{1}{2}$.

Simplifying improper fractions

Have a look at the fractions $\frac{7}{2}$ and $\frac{12}{8}$.

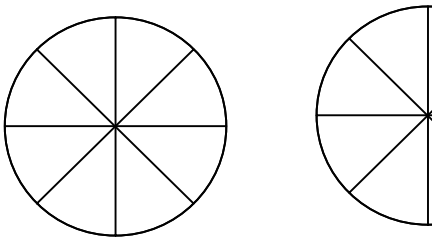
Looking at $\frac{7}{2}$: there are **two** halves in a whole, so in **seven** halves there are **3** wholes and **one half** left over - which is $3\frac{1}{2}$. This is called a **mixed fraction** or **mixed number**.

In other words, 7 ÷ 2 = 3 remainder 1. So the answer written as a mixed fraction is $3\frac{1}{2}$.

Looking at $\frac{12}{8}$: there are **eight** eighths in a whole, so in **12** eighths there's **one** whole and four eighths left over - which is $1\frac{4}{8}$.

In other words, 12 ÷ 8 = 1 remainder 4. So the answer written as a mixed fraction is $1\frac{4}{8}$.

Did you notice that $\frac{4}{8}$ can be simplified again to $\frac{1}{2}$ making the correct answer $1\frac{1}{2}$?



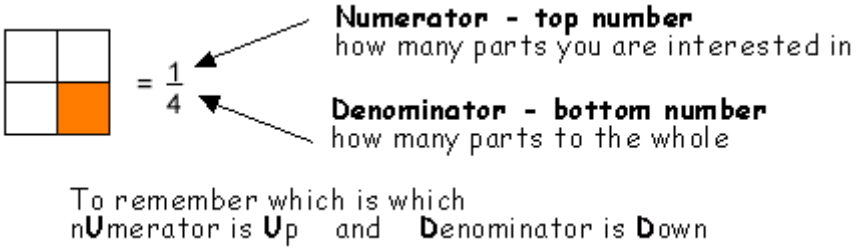
Summary
To change an improper or top-heavy fraction to a mixed number - in other words, a number and a fraction:

1. Divide the **top** number by the **bottom**. This gives you the number of whole ones you need.
2. Work out the **remainder**. This gives you the fraction that's **left over**.
3. See if the answer needs to be **simplified**. In other words, can you divide the top and bottom by the same number without a remainder.

Key words for fractions

Fraction
Any part of a whole. When you divide something into equal pieces, each piece is a fraction of the whole thing.

Numerator and denominator
Fractions are written as one number on top of another. For example a half is written as 1 on top of 2 like this $\frac{1}{2}$.



The parts are given the names **numerator** and **denominator**.

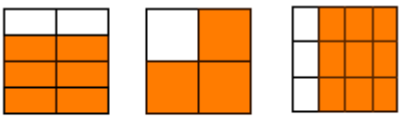
Common fraction or **proper fraction**
Common fractions are smaller than 1. They are also called **proper fractions**. For example, $\frac{2}{5}$.

Improper fraction or **top-heavy fraction**
Improper fractions are bigger than 1. They are also called **top-heavy fractions**. For example, $\frac{9}{4}$.

Mixed number
Mixed numbers are bigger than 1. A mixed number is a combination of a whole number and a common fraction. For example, $2\frac{1}{4}$.

Equivalent fraction
Equivalent fractions have the same value. For example, $\frac{2}{4} = \frac{1}{2}$.

You can make equivalent fractions by multiplying or dividing the top and bottom of a fraction by the same number.



Reducing, simplifying or **cancelling down** fractions
To simplify a fraction you divide the numerator and the denominator by the largest number that divides into both exactly. The value of the fraction stays the same. This is also called **reducing** or **simplifying**.

E.g. $\frac{18 \div 9}{45 \div 9} = \frac{2}{5}$

Key words for fractions

Compare
When you compare fractions you have to put them in order of size.

You'll find more maths words explained in the **Skillswise glossary**.

More fractions in words

How do you write **three quarters** in figures?

One quarter would be $\frac{1}{4}$. Three quarters is written $\frac{3}{4}$. The 3 on the top of $\frac{3}{4}$ tells us we have 3 lots of the $\frac{1}{4}$.

One tenth is written $\frac{1}{10}$. How do you write three tenths? You write it with a 3 on the top to show you have three lots of $\frac{1}{10}$. So three tenths is written $\frac{3}{10}$.

Here are some more examples of fractions in words.

Words	Figures			Words	Figures
one quarter	$\frac{1}{4}$			three quarters	$\frac{3}{4}$
two fifths	$\frac{2}{5}$			three eighths	$\frac{3}{8}$
four fifths	$\frac{4}{5}$			two thirds	$\frac{2}{3}$

Can you see how it works? The first number goes on the top, the second number on the bottom.

Mixing whole numbers and fractions
Suppose a film lasts one and a half hours. How do you write this in figures? You write the 1 then the half, like this, $1\frac{1}{2}$ hours.

It's the same with other mixes of whole numbers and fractions. For example:

- two and a quarter written in figures is $2\frac{1}{4}$
- one and three quarters written in figures is $1\frac{3}{4}$
- one and two thirds written in figures is $1\frac{2}{3}$

Have a look at this number: $99\frac{9}{10}$. It's **ninety nine** and a fraction. The fraction has a 10 on the bottom so it's tenths. There is a 9 on the top of the fraction so it's **nine tenths**. So the number written in words is **ninety nine and nine tenths.**

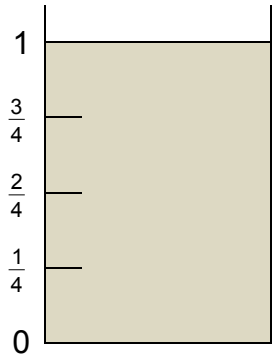
More improper fractions

Have a look at these fractions: $\frac{9}{4}, \frac{7}{2}, \frac{12}{5}, \frac{15}{7}$.

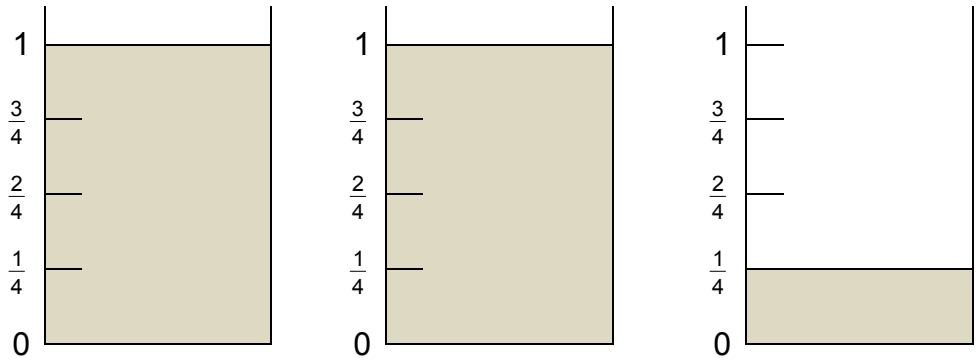
These are also **improper** fractions because the top number is bigger than the bottom number. You can divide the **bottom number** into the **top number** to simplify the fraction into **whole numbers**, but it doesn't divide exactly. There is a **remainder**, which you need to write as a **fraction**.

Example
A recipe uses a quarter of a litre of milk per person. For nine people this would be nine quarters, in other words $\frac{9}{4}$ litres. What is this as a mixed number? How many full litres are there? What is the remainder - how much is left over?

When you have a denominator, or bottom number, of **4** you are dealing with **quarters**. Four quarters equal one whole, or 1.



Eight quarters equal two wholes, or two. One more quarter is **nine** quarters, which is two wholes and one quarter left over.



You can write $\frac{9}{4}$ as a mixed number: $2\frac{1}{4}$. This means nine lots of a quarter litres is $2\frac{1}{4}$ litres.

Two-step fraction problems

You can use unit fractions to help you solve harder problems.

Example
To find $\frac{3}{4}$ of a box of 24 chocolates, think of the calculation as three lots of $\frac{1}{4}$ of the chocolates.

First find $\frac{1}{4}$ of 24: 24 ÷ 4 = 6.

Then multiply the answer by 3: 3 × 6 = 18.

So the answer is **18 chocolates**.

Example
To find $\frac{2}{3}$ of a box of 24 chocolates, think of the calculation as two lots of $\frac{1}{3}$ of the chocolates.

First find $\frac{1}{3}$ of 24: 24 ÷ 3 = 8.

Then multiply the answer by 2: 2 × 8 = 16.

So the answer is **16 chocolates**.

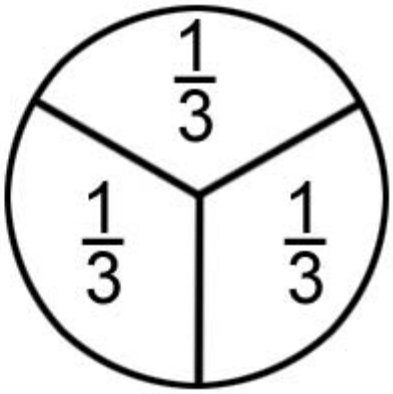
You need to remember what numbers to divide and multiply by. You do this by looking at the fraction you want. The bottom number – denominator - is the dividing number and the top number – numerator - is the multiplying number.

Fraction	Divide by	Multiply by
$\frac{2}{5}$	5	2
$\frac{6}{7}$	7	6
$\frac{3}{10}$	10	3
$\frac{5}{8}$	8	5
$\frac{9}{12}$	12	9

Unit fractions and sharing

This pizza has been cut into three equal parts. We call these **thirds**. You can write one third as $\frac{1}{3}$.

The whole pizza cut into three equal parts gives us three thirds.



Think about just one slice. This is one third. You can write one third as the fraction $\frac{1}{3}$.

$\frac{1}{3}$

Think about two slices. Two slices make two thirds. You can write two thirds as $\frac{2}{3}$.

$\frac{2}{3}$

The **top** number of the fraction tells us how many slices we have. This number is the **numerator**.

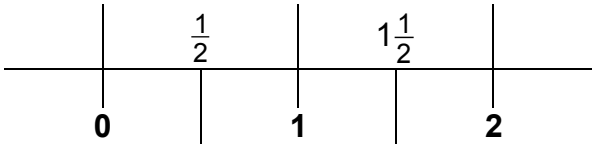
The **bottom** number tells us how many parts there are in the whole pizza. This number is the **denominator**.

What are mixed numbers?

A number like $1\frac{1}{2}$ is called a mixed number because it is a mix of a whole number and a fraction.

The whole number part is 1.

The fraction part is $\frac{1}{2}$.



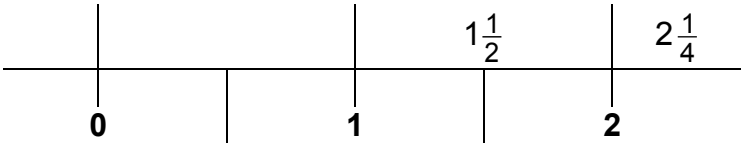
Here are some more examples of mixed numbers: $2\frac{7}{8}$, $6\frac{2}{3}$, $10\frac{3}{4}$, $33\frac{1}{3}$, $99\frac{9}{10}$.

Comparing mixed numbers

When you compare the size of two mixed numbers the first things to check are the whole number parts. If one has a smaller whole number part than the other then it is the smaller number.

For example, $1\frac{1}{2}$ is less than $2\frac{1}{4}$ because 1 is less than 2.

When the whole number parts are the same you need to check the fraction parts.

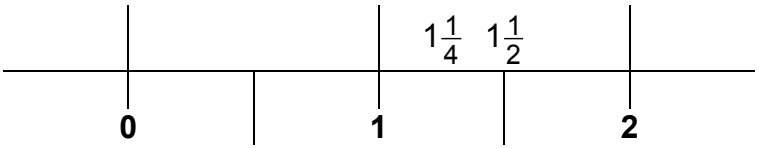


Example

Which is smaller, $1\frac{1}{4}$ or $1\frac{1}{2}$?

Both are mixed numbers. First compare the whole number parts. Both have a whole number part of 1. So you need to compare the fraction parts.

$\frac{1}{4}$ is less than $\frac{1}{2}$, so $1\frac{1}{4}$ is less than $1\frac{1}{2}$.

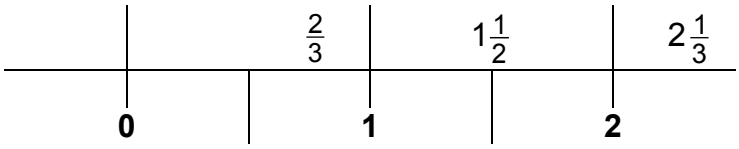


When you compare fractions with mixed numbers the fractions have no whole number part, so they are smaller than the mixed numbers.

Example

Put these in order, smallest first:

$2\frac{1}{3}$, $\frac{2}{3}$, $1\frac{1}{2}$.



The smallest is $\frac{2}{3}$ because the others have whole number parts.

$1\frac{1}{2}$ is smaller than $2\frac{1}{3}$ because it has a smaller whole number part.

So the correct order, smallest first, is $\frac{2}{3}$, $1\frac{1}{2}$, $2\frac{1}{3}$.